Call Display Specification

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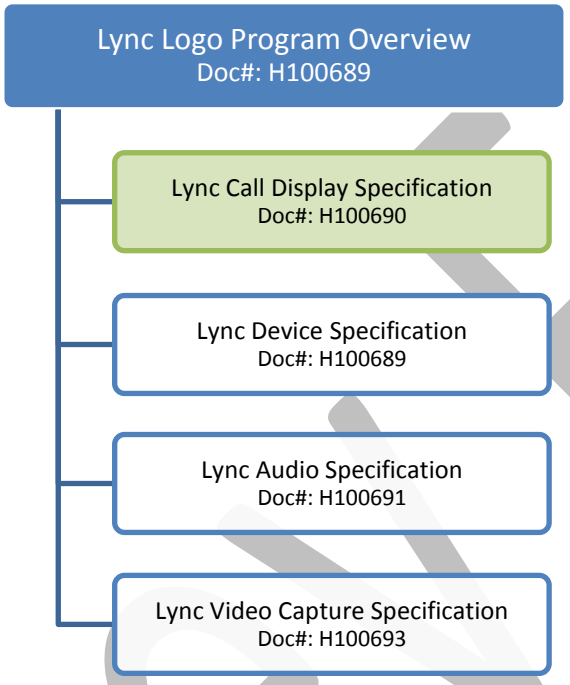
Table of Contents

1.0 Revision History

Rev.	Date	Description	Author/Revised by
A	July 2009	Creation of initial Office Communicator Devices Specification 2.0 and disseminated for review.	David Ramsey
B	November 2009	Stylistic modifications, Updated TDA language and terms.	David Ramsey
C	April 2009	Updated Overview doc structure	Jyoti Black
D	October 2010	Removed reference to Alphanumeric Display in Vendor Extension; Clarified Display Protocol version; Added 'Conversation Id' display attribute; Added volatility information for display attributes; Added 'Report Type Definitions'; corrected second byte of Character Attributes report (removed 'position' bits);Added Display Setup Info report; Icons Control report –changed Mute to a 2 bit element and Speaker to deprecated; updated HID Usage table; Changed name of product and related references to Lync. Removed note that 'other caller number' is for SIP endpoints only.	Doug Anderson / Rachel An
E	Aprl 2011	No major updates	Doug Anderson
F	October 2011	No major updates	Doug Anderson

2.0 Test Specifications

The family of documents supporting the Lync logo program is shown below and contains detailed requirements that candidate devices, being submitted to the Lync logo program, must meet. The technical requirements that are listed herein have been derived solely for the purpose of maximizing interoperability and optimizing the functional and quality experience of devices used with the Microsoft Lync platform. The test specifications are split into the four categories shown here:



This *Lync Display Specification* document describes the specific-HID commands that telephony HID devices with a display would use to reflect the Lync call state to the end-user. This document highlights the various Vendor Extensions, Display Attributes, and Display Control that are available to the device maker to properly communicate screens associated with the Lync call state to the device's display.

2.1 Additional References

This document references the following industry standards as well:

Document Name	Link
Universal Serial Bus Specification (v2.0)	http://www.usb.org/developers/docs/

2.2 Contacting Microsoft

For any questions regarding the requirements detailed in the specification, please contact the Lync Partner Team by sending an email message to lynclogo@microsoft.com.

2.3 Terms

This section describes standard terms and conventions used throughout this specification.

W12	Abbreviation for “Wave 12”, Microsoft Office Communications Server 2007 platform launched in 2007.
W13	Abbreviation for “Wave 13”, Microsoft Office Communications Server 2007 R2 platform launched in 2009.
W14	Abbreviation for “Wave 14” or codename for Microsoft Lync 2010 launched in 2010.
UC	Unified Communications, a set of products and services integrating non real-time and real-time communication services into a consistent and coordinated user interface and experience.
OC	Office Communicator, the original name for the implementation of unified communications from Microsoft. Replaced by Lync in the 2010 release.
Lync	The implementation of unified communications from Microsoft.
HID	Acronym for Human Interface Device (HID)
UCQ	UC Qualification (UCQ) string, the set of fields sent to Lync by a device that indicates which Lync-qualified device categories are supported by the device.
Call Control Buttons	Refers to the physical buttons potentially present on a device manufacturer’s headset, handset or speakerphone, or present on an inline call/sound control for corded devices to manage sound and call activities. These can vary, depending on the specific feature set implementation and device partner terminology (Flash Button, Mute Button, Volume Control, Speaker Button, Multifunction Control). Please refer to the specific device.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119.

3.0 Lync Display Requirements

Display requirements supporting Microsoft Office Communications Server 2007 R2 and Microsoft Lync 2010 are categorized into three (3) classes: Vendor Extensions, Display Attributes, and Display Control.

3.1 Vendor Extensions

When a device initially registers itself with Lync that it supports display functionality, Lync will open a handle to the display device and will query the device for the Vendor Extension " HID feature report.

Devices supporting current version of the Lync Display Protocol must be preconfigured with screens corresponding to the various Lync call states. The screens displayed associated with each Lync call state will be dynamically specified by Lync during the open session.

Upon initialization, the following table outlines the *Vendor Extension Report* requested by Lync:

Table 1 Vendor Extensions Report

Byte \ Bit	7	6	5	4	3	2	1	0
0	ReportID							
1	Vendor Id							
2								
3	Display Protocol Version							
4								

Vendor Extension Report Notes:

1) **"Report ID"** returns the ID of the specific requested report.
2) "**Vendor Id**" returns the ID of the vendor whose vendor-specific Alphanumeric Display usage page is supported by the device. This must be set to 0x045e (Microsoft) and is not configurable.
3) "**Display Protocol Version**" The version of the Lync display protocol that the device is designed to interface with. Devices designed according to this specification should use display protocol version "2", which is used in OC 2007 R2 and newer clients.

3.2 Display Attributes

Upon initialization, the following table outlines the *Display Attributes Report* requested once by Lync:

Table 2 Display Attributes Report

Byte \ Bit	7	6	5	4	3	2	1	0
0	ReportID							
1	Rows							
2	Columns							
3	Display Field Support Index							

4	

Display Attributes Report Notes:

4) **"Report ID"** returns the ID of the specific requested report.
5) **"Rows"** identifies the maximum number of rows supported by the device's volatile display. This field is currently ignored by Lync.
6) **"Columns"** identifies the number of columns supported by the device's volatile display. This field is currently ignored by Lync.
7) **"Display Field Support Index"** identifies what display fields are supported by the device, with each bit corresponding to a single display field. For example, byte 3 bit 0 (index 1 as in the following table) is used for "Local User Name".

Table 3: Display field support index

BaseUsage + Index	Display Field Name	Volatility[1]
1	Local User Name	N
2	Local User Status	N
3	Date	N
4	Time	N
5	Call Status	Y
6	Other Party Name	Y
7	Other Party Title	Y
8	Subject	Y
9	Duration	Y
10	Number	Y
11	Other Party Number[2]	Y
12	Conversation Id	y

[1] Volatile items should be cleared by a 'clear display' command or when a different (non-zero) screen select value is received.

[2] Field is empty for SIP endpoints

3.3 Display Control

The *Display Control Report* can be sent from Lync to a device anytime a device handle remains open to request that the device perform certain screen-related functions such as turn on the backlight, clear the screens, or update the screens.

The following table outlines the display control attributes report:

Table 4 Display Control Report

Byte \ Bit	7	6	5	4	3	2	1	0
0	ReportID							
1	Pad	Screen Select				Backlight	Clear Display	Enable Display

Notes:

1) **"Report ID"** returns the ID of the specific requested report.
2) **"Pad"** is unused.
3) **"Enable Display"** is used to enable (byte 1 bit 0 set to "1") or disable (byte 1 bit 0 set to "0") the display. As soon as it is enabled, this field should remain set to "1" for all Display Control-Reports until the display is disabled .
4) **"Clear Display"** is used between screen updates to reinitialize the screen. Byte 1 bit 1 set to "0" requests no change in the screen state. Byte 1 bit 1 set to "1" requests the device to clear all volatile (call related) information from the display screen.
5) **"Backlight"** is turned on by Lync when there is a change in the display or when the user pushes any buttons on the device. Byte 1 bit 2 set to "0" requests no change in the device backlight state. Byte 1 bit 2 set to "1" requests the device to turn on the backlight. Under all conditions, the device is responsible for timing-out the backlight and turning it off after 3 seconds from the initial request.
6) **"Screen Select"** is used by Lync to specify which of the preconfigured screens the device should display. A Screen Select set to "0" requests no change in the device screen state. Any other value in the Screen Select field requests that all volatile displays be cleared and refreshed with the appropriate display as follows:

   "0" – No Change
   "1" – Home Screen (Idle Mode)
   "2" – Ready To Call
   "3" – Outgoing Call
   "4" – Incoming Call
   "5" – In Call
   "6" – Hold Call
   "7" – End Call

Values "8" to "10" in the Screen Select field are reserved for future use.

3.3.1 Report Type Definitions

In order to properly support displays, the device must announce the following report names and report types. The device SHALL use interrupt OUT pipe for HID output reports defined in this display protocol.

Table 5 Report Type Definitions

Report Name	Report Type	Data Flow Direction
Vendor Extension	HID Feature	Device to Lync
Display Attributes	HID Feature	Device to Lync
Display Setup Info	HID Feature	Lync to Device
Display Control	HID Output	Lync to Device
Character Report	HID Output	Lync to Device
Icons Report	HID Output	Lync to Device
Character Attribute	HID Output	Lync to Device

3.3.2 Character Attributes

The *Character Attributes Report* is sent from Lync to the device with instructions on how the device is to display a text string. It can be used for predefined text strings as specified by the Display Id. It can also be used for additional text strings by setting Txt field, byte 2 bit 7, to "1" and appending the character reports for the device (see Section 3.3.2).

Table 6 Character Attributes Report

Byte \ Bit	7	6	5	4	3	2	1	0
0	ReportID							
1	Display Field Usage Index							
2	Txt	Pad						

Notes:

1) **"Report ID"** returns the ID of the specific requested report.
2) "**Display Field Usage Index**" contains the text displays and associated index as defined in Table 1.
3) **"Pad"** is unused.
4) **Txt (text string follows)**: Specifies if *character report* for text string follows.

   0: No character report follows

   1: The text string for this display property follows.

3.3.3 Character Report

The *Character Report* is used to send a text string from Lync to the device. Multiple *Character Reports* might be necessary if the text string is more than eight (8) characters.

Table 7 Character Report

Byte \ Bit	7	6	5	4	3	2	1	0
0	ReportID							
1	Last	Pad						
2	Display Data 0							
3								
4 … **15**	Display Data 1-6							
16	Display Data 7							
17								

Notes:

1) "**Report ID**" returns the ID of the specific requested report.
2) **"Pad"** is unused.
3) "**Last"** specifies if this *Character Report* is the last *Character Report* for the specific text string:
   - If the "Last" field contains "0"**,** there are more *Character Reports* associated with the text string.
   - If the "Last" field contains "1"**,** this is the last *Character Report* for the text string.
4) **"Display Data"** specifies the UTF-16BE code for the character to display. A maximum of eight (8) characters can be specified in a *Character Report*. To continue a text line longer that eight (8) characters, future reports for the same row will set Append to be "1". Because the HID specification requires that reports be fixed in length, all characters must be specified and any characters after the last valid character is set to Code Point NUL (0x0000) and should be ignored by the display.

3.3.4 Icons Control

The *Icons Control Report* is used to send requests that are related to icon status and updates:

Table 8 Icons Control Report

Byte \ Bit	7	6	5	4	3	2	1	0
0	ReportID							
1	Modality				Presence Icon			
2	Pad		Mute		Missed Call	Speaker	Voice mail	Fwd

Notes:

Report displayed is an example only. Devices may arrange the elements in Byte #2 differently depending on how they define their report.

1) "**Report ID**" returns the ID of the specific requested report.
2) "**Presence Icon**" specifies the presence icon for local user with values that are defined as follows:

Table 9 Presence Icon States

Value	Icon
0	Not Set
1	Online
2	Idle
3	Busy
4	Busy/ Idle
5	Away
6	Do Not Disturb
7	Offline
8	Online/ Idle

3) **"Modality"** is reserved by Microsoft and not supported by Lync for the Microsoft Office Communications Server 2007 R2 platform.
4) **"Fwd"** (Call Forwarding Icon) specifies the request for displaying the call forwarding icon:
   - If the "Fwd" field contains "0"**,** the call forwarding icon should not be displayed.
   - If the "Fwd" field contains "1**",** the call forwarding icon should be displayed.
5) **"Voice mail"** specifies the request for displaying the voice mail icon:
   - If the "Voice mail" field contains "0"**,** the **v**oice mail icon should not be displayed.
   - If the "Voice mail" field contains "1**",** the **v**oice mail icon should be displayed.
6) **"Mute"** specifies the request for displaying the mute icon: *
   -1: Mute icon off

0: No change in mute icon

1: Mute icon on

7) **"Speaker"** deprecated after 2007 R2.

8) **"Missed Call"** is not implemented in this version of Lync.

* Note: previous versions of this specification allowed a 1-bit mute state, to avoid unexpected changes in mute state for non-Lync applications, devices shall use the 2-bit mute state referenced here.

3.3.5 Display Setup Info

This is an optional report that Lync uses to tell device display related info about the Lync client. Lync will only send this report if device claims support for the Lync language Id usage.

Byte \ Bit	7	6	5	4	3	2	1	0
0	ReportID							
1	Lync language Id lower byte							
2	Lync language Id higher byte							
3	Lync display Minor Version							
4	Lync display Major Version							

Notes:

Lync language Id is the language identifier used in Lync locale.

Lync display version is the display protocol version used by Lync. Currently, Minor = 1, Major = 2.

3.3.6 HID Usage table

The following table presents the supported HID usages defined under UC customer usage Page FF99.

Usage ID[1]	Usage Name	Usage Type
01	UC display	CA
Display Properties		
81	Local User Name	DF
82	Local User Status	DF
83	Date	DF
84	Time	DF
85	Call Status	DF
86	Other Party Name	DF
87	Other Party Title	DF
88	Subject	DF
89	Duration	DF
8A	Number	DF

8B	Other Party Number	DF
8C	Conversation Id	DF
FF00	Vendor Extension	CL
FF01	Vendor Id	SV
FF02	Version	DV
20	Display Attributes	CL
35	Rows	SV
36	Columns	SV
24	Display Control	CL
26	Enable Display	DF
25	Clear Display	DF
FF10	Backlight	DF
FF11	Screen Select	DV
FF17	Icons Control	CL
FF18	Presence Icon	DV
FF19	Modality	DV
FF1A	Call Forward Icon	DF
FF1B	Voice Mail Icon	DF
FF1C	Mute Icon	DF
FF1F	Speaker Icon	DF
FF20	Missed Call Icon	DF
FF1E	Display Refresh[2]	DF
48	Character Attributes	CL
FF21	Display Field	DV
FF22	Text String Followed	DF
FF23	Display Field Position	DV
2B	Character Report	CL
FF24	Last Character Report	DF
64	OC Language Id	DV
65	OC Display version	DV

[1]Select display related Usage IDs listed. Other Usage IDs may be used (e.g. for media related purposes) and would be documented elsewhere.

[2]Supported under the telephony collection rather than the display collection (display collection is a one-way flow of information from Lync to device).

3.3.7 HID Report Descriptor

Lync Display functionality is a Microsoft proprietary protocol and cannot be implemented using only the usages defined in the industry standard version 2 of the Alphanumeric Display usage page. Lync will send an appropriate HID Report Descriptors upon receiving an UCQ string descriptor from the device. Devices supporting display functionality must implement a partner specific page, FF99, in addition to the usages described below.

As an example, the following is the HID report descriptor of the display for a device that does not support menu functions.

LCD Display

```
//-------- LCD display ----------------------------------
0x06, 0x99, 0xFF, // USAGE_PAGE (Custom UC Display)
0x09, 0x01,       // USAGE (UC_DISPLAY)
0xA1, 0x01,       // COLLECTION (Application)
```

Vendor Extension

```
//--------- Vendor Extension ---------------------------
0x0A, 0x00, 0xFF, //   USAGE (Vendor Extension)
0xa1, 0x02,       //   COLLECTION (Logical)
0x85, 0x11,       //     Report ID (11)

0x15, 0x00,       //     Logical Minimum (0),
0x27, 0xFF, 0xFF, 0x00, 0x00, //     Logical Maximum (65535)
0x95, 0x01,       //     REPORT_COUNT (1)
0x75, 0x10,       //     REPORT_SIZE (16)
0x0A, 0x01, 0xFF, //     USAGE (Vendor Id)
0xB1, 0x03,       //     FEATURE (Cnst,Var,Abs)

0x26, 0xFF, 0x00, //     Logical Maximum (255)
0x95, 0x02,       //     REPORT_COUNT (2)
0x75, 0x08,       //     REPORT_SIZE (8)
0x0A, 0x02, 0xFF, //     USAGE (Version)
0xB1, 0x03,       //     FEATURE (Cnst,Var,Abs)
0xc0,             //   END_COLLECTION
```

Display Attributes

```
//--------- Display Attributes ---------------------------
```

```
0x09, 0x20,        //   USAGE (Display Attributes)
0xa1, 0x02,        //   COLLECTION (Logical)
0x85, 0x12,        //     Report ID (12)

0x09, 0x35,        //     USAGE (Rows)
0x09, 0x36,        //     USAGE (Columns)
0x15, 0x00,        //     Logical Minimum (0),
0x26, 0xFF, 0x00, //     Logical Maximum (255)
0x95, 0x02,        //     REPORT_COUNT (2)
0x75, 0x08,        //     REPORT_SIZE (8)
0xB1, 0x03,        //     FEATURE (Cnst,Var,Abs)

0x19, 0x81,        //     USAGE_MINIMUM (first Display Property)
0x29, 0x8A,        //     USAGE_MAXIMUM (last Display Property)
0x25, 0x01,        //     Logical Maximum (1),
0x95, 0x0A,        //     REPORT_COUNT (10)
0x75, 0x01,        //     REPORT_SIZE (1)
0xB1, 0x03,        //     FEATURE (Cnst,Var,Abs)

0x95, 0x01,        //     REPORT_COUNT (1)
0x75, 0x06,        //     REPORT_SIZE (6)
0xB1, 0x03,        //     FEATURE (Const,Var,Abs)  //Pading 6
0xc0,              //   END_COLLECTION
```

Display Control Report

```
//--------- Display Control Report ---------------------------
0x09, 0x24,        //   USAGE (Display Control)
0xA1, 0x02,        //   COLLECTION(Logical)
```

```
0x85, 0x13,       //   Report ID (13)


0x09, 0x26,       //     USAGE (Enable Display)
0x09, 0x25,       //     USAGE (Clear Display)
0x0A, 0x10, 0xFF, //     USAGE (Back Light)
0x15, 0x00,       //     Logical Minimum (0),
0x25, 0x01,       //     Logical Maximum (1),
0x95, 0x03,       //     REPORT_COUNT (3)
0x75, 0x01,       //     REPORT_SIZE (1)
0x91, 0x02,       //     OUTPUT (Data,Var,Abs)


0x0A, 0x11, 0xFF, //     USAGE (Screen Select)
0x25, 0x0F,       //     Logical Maximum (15),
0x95, 0x01,       //     REPORT_COUNT (1)
0x75, 0x04,       //     REPORT_SIZE (4)
0x91, 0x02,       //     OUTPUT (Data,Var,Abs)


0x75, 0x01,       //     REPORT_SIZE (1)
0x91, 0x03,       //     OUTPUT (Const,Var,Abs)  //Pading 1
0xc0,             //   END_COLLECTION
```

Character Attribute Report

```
//--------- Character Attributes ---------------------------
0x09, 0x48,       //   USAGE (Character Attributes)
0xA1, 0x02,       //   COLLECTION(Logical)
0x85, 0x14,       //   Report ID (14)


0x19, 0x81,       //     USAGE_MINIMUM (Local User Name)
```

```
0x29, 0x8A,        //     USAGE_MAXIMUM (Number)
0x15, 0x01,        //     LOGICAL_MINIMUM (1)
0x25, 0x0A,        //     LOGICAL_MAXIMUM (10)
0x95, 0x01,        //     REPORT_COUNT (1)
0x75, 0x04,        //     REPORT_SIZE (4)
0x91, 0x00,        //     OUTPUT (Data,Ary,Abs)

0x95, 0x01,        //     REPORT_COUNT (1)
0x75, 0x04,        //     REPORT_SIZE (4)
0x91, 0x03,        //     OUTPUT (Const,Var,Abs)  //Pading 4

0x95, 0x01,        //     REPORT_COUNT (1)
0x75, 0x05,        //     REPORT_SIZE (7)
0x91, 0x03,        //     OUTPUT (Const,Var,Abs)  //Pading 7

0x0A, 0x22, 0xFF, //     USAGE (Text String Followed)
0x25, 0x01,        //     Logical Maximum (1),
0x95, 0x01,        //     REPORT_COUNT (1)
0x75, 0x01,        //     REPORT_SIZE (1)
0x91, 0x02,        //     OUTPUT (Data,Var,Abs)

0xc0,              //   END_COLLECTION
```

Character Report

```
//--------- Character Report ---------------------------
0x09, 0x2B,        //   USAGE (Character Report)
0xA1, 0x02,        //   COLLECTION(Logical)
0x85, 0x15,        //   Report ID (15)
```

```
0x95, 0x01,        //     REPORT_COUNT (1)
0x75, 0x07,        //     REPORT_SIZE (7)
0x91, 0x03,        //     OUTPUT (Const,Var,Abs)  //Pading 7

0x0A, 0x24, 0xFF, //     USAGE (Last Character Report)
0x15, 0x00,        //     Logical Minimum (0),
0x25, 0x01,        //     Logical Maximum (1),
0x95, 0x01,        //     REPORT_COUNT (1)
0x75, 0x01,        //     REPORT_SIZE (1)
0x91, 0x02,        //     OUTPUT (Data,Var,Abs)

0x0A, 0x2C, 0xFF, //     USAGE (Display Text Data)
0x27, 0xFF, 0xFF, 0x00, 0x00, //     Logical Maximum (65535)
0x95, 0x08,        //     REPORT_COUNT (8)  // 8 unicode char
0x75, 0x10,        //     REPORT_SIZE (16)
0x91, 0x02,        //     OUTPUT (Data,Var,Abs)

0xc0,              //   END_COLLECTION
```

Icons Report

```
//--------- Icons Report ------------------------------------
0x0A, 0x17, 0xFF, //   USAGE (Icons Control)
0xA1, 0x02,        //   COLLECTION(Logical)
0x85, 0x16,        //   Report ID (16)

0x0A, 0x18, 0xFF, //     USAGE (Presence Icon)
0x15, 0x00,        //     Logical Minimum (0),
```

```
0x25, 0x0F,        //     Logical Maximum (15),

0x95, 0x01,        //     REPORT_COUNT (1)

0x75, 0x04,        //     REPORT_SIZE (4)

0x91, 0x02,        //     OUTPUT (Data,Var,Abs)


0x75, 0x04,        //     REPORT_SIZE (4)

0x91, 0x03,        //     OUTPUT (Const,Var,Abs)   //Pading 4


0x0A, 0x1A, 0xFF, //     USAGE (Call Forward Icon)

0x0A, 0x1B, 0xFF, //     USAGE (Voicemail Icon)

0x0A, 0x1F, 0xFF, //     USAGE (Speaker Icon)???

0x0A, 0x20, 0xFF, //     USAGE (Missed Call Icon)???

0x25, 0x01,        //     Logical Maximum (1),

0x95, 0x04,        //     REPORT_COUNT (4)

0x75, 0x01,        //     REPORT_SIZE (1)

0x91, 0x02,        //     OUTPUT (Data,Var,Abs)


0x95, 0x01,        //     REPORT_COUNT (1)

0x75, 0x02,        //     REPORT_SIZE (2)

0x15, 0xff,        //     LOGICAL_MINIMUM (-1)

0x25, 0x01,        //     LOGICAL_MAXIMUM (1)

0x0A, 0x1C, 0xFF, //     USAGE (Mute Icon)

0x91, 0x26,        //     OUTPUT (Data, Variable, Relative, No Preferred)  //
2 bitsd --> output


0x75, 0x02,        //     REPORT_SIZE (2)

0x91, 0x03,        //     OUTPUT (Const,Var,Abs)  //Pading 2


0xc0,              //   END_COLLECTION
```

```
//--------- Display Setup Info Report ----------------------------------

0xA1, 0x02,       //   COLLECTION(Logical)

0x85, 0x17,       //   Report ID (17)


0x15, 0x00,       //    Logical Minimum (0),

0x27, 0xFF, 0xFF, 0x00, 0x00, //     Logical Maximum (65535)

0x95, 0x01,       //    REPORT_COUNT (1)

0x75, 0x10,       //    REPORT_SIZE (0x10, 16)

0x09, 0x64,       //    USAGE (Language ID Report)

0xB1, 0x02,       //    FEATURE (Data, Variable, Absolute)


0x26, 0xFF, 0x00, //    Logical Maximum (255)

0x95, 0x02,       //    REPORT_COUNT (2)

0x75, 0x08,       //    REPORT_SIZE (8)

0x09, 0x65,       //    USAGE (OC Version)

0xB1, 0x02,       //    FEATURE (Data, Variable, Absolute)

0xc0,             //   END_COLLECTION


0xc0              // END_COLLECTION
```